UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS

UNITED STATES OF AMERICA	)	
	)	
v.	)	**Crim No.13-10200-GAO**
	)	
DZHOKHAR A. TSARNAEV,	)	**FILED UNDER SEAL**
Defendant	)	

GOVERNMENT'S OPPOSITION TO DEFENDANT'S MOTION TO EXCLUDE TOOLMARK IDENTIFICATION EVIDENCE AND REQUEST FOR DAUBERT HEARING

The United States, by and through undersigned counsel, respectfully submits this opposition to defendant Dzhokhar Tsarnaev's motion to exclude toolmark identification evidence and request for a Daubert hearing. Tsarnaev's primary argument, that toolmark identification is inherently unreliable and therefore categorically inadmissible, has been soundly rejected by federal district and appellate courts. In fact, courts have held — consistently and repeatedly — that firearm and toolmark identification evidence satisfies the reliability standards set forth in Fed. R. Evid. 702 and Daubert v. Merrell Dow Pharmaceutical, 509 U.S. 579 (1993), and is a proper subject for expert testimony. Since established precedent resolves the threshold reliability inquiry, and Tsarnaev does not argue either that the individual examiners are unqualified or that they failed to apply established toolmark identification methods to the facts of this case, an evidentiary hearing is not required to determine the admissibility of the government's proffered expert firearm and toolmark identification testimony. For these and the reasons set forth below, the Court should deny Tsarnaev's motion without a hearing.

INTRODUCTION

The underlying principle of toolmark identification is that an object will transfer a unique set of marks when it comes in contact with another object. For example, a firearm will transfer unique marks to ammunition fired from that gun and a wire cutter will transfer unique marks to the wire it cuts, crimps, or strips. By using a comparison microscope to compare ammunition test-fired from a gun to ammunition recovered from the scene of a crime, or to compare wires cut or crimped from a wire cutter with cut or crimped wires recovered from the scene of a crime, a trained toolmark examiner determines whether the recovered ammunition was fired by the gun or the recovered wire was cut or crimped by the wire cutter. In making this determination, the examiner considers the presence or absence of class characteristics or those features common to a particular make, model, or type of gun or tool; subclass characteristics or those features common to a group of like guns or tools manufactured at the same facility or using the same machining process; and individual characteristics or those features unique to a particular gun or tool imparted by the manufacturing process, repeated use, and wear over time. If the unique surface contours of two toolmarks are in "sufficient agreement," the examiner may conclude that the marks were made by the same object. See generally Theory of Identification (hereinafter "AFTE Theory"), Association of Firearm and Toolmark Examiners ("AFTE"), 30 AFTE J. 86 (1998).

Following Tsarnaev's arrest on April 19, 2013, the government collected evidence from various locations, including Laurel Street in Watertown (where the Tsarnaevs fired upon and threw bombs at police) and 401 Norfolk Street, Apartment 3 in Cambridge (Tsarnaev's residence). The government recovered (among other things) a Ruger P95 semi-automatic pistol ("the Ruger"), numerous discharged cartridge casings and spent projectiles, and three pieces of

green insulated wire from Laurel Street; and a pair of wire cutters from the Norfolk Street apartment. Those items were submitted to the Massachusetts State Police ("MSP") and Federal Bureau of Investigation ("FBI") for forensic testing by examiners trained in toolmark identification.[1] As the government stated in its September 2, 2014 expert disclosure letter, it intends to qualify two examiners as expert witnesses to testify at trial as to the results of and conclusions drawn from their toolmark identification analysis.

First, Lieutenant David Cahill, a trained ballistics (or firearm toolmark) examiner who is the Executive Officer of the MSP Firearms Identification Section, conducted a physical and microscopic examination of the Ruger and discharged cartridge casings and spent projectiles recovered from Laurel Street, and compared the recovered cartridges and projectiles against cartridges and projectiles test-fired from the Ruger. Lieutenant Cahill will testify that that the Ruger fired numerous cartridge casings and projectiles recovered from the Laurel Street location: Item Nos. 4-54 through 4-78, 4-80 through 4-111, 4-122, 4-125, 5-80, 5-81, 61-2, 61-3, and 61-5 as identified in MSP Case No. 13-08140; and Items Nos. 7-6 through 7-15 as identified in MSP Case No. 13-08091. It is also his opinion that the projectiles identified in MSP Case No. 13-08140 as Item Nos. 61-1, 61-3, and 61-5 have the same class characteristics as the Ruger. This testimony links the participants in the Watertown shootout, including the defendant, to the murder of Officer Sean Collier at the Massachusetts Institute of Technology earlier that night.

The basis for Lieutenant Cahill's opinion with respect to the projectiles is that the class characteristics of the Ruger (e.g., the pitch, twist, number, and width of the barrel's lands and grooves), as well as the barrel's individual characteristics (e.g., striations along the barrel's lands and grooves), as made manifest on test-fired projectiles, matched the markings on the recovered

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projectiles. The basis for his opinion with respect to the casings is that the class characteristics of the casings (e.g., manufacturer, shape, and caliber) matched the Ruger, and their individual characteristics (e.g., firing pin aperture sheer marks, firing pin drag marks, and breech face marks) matched the corresponding characteristics of casings ejected from the Ruger during a test fire.

Second, physical scientist Erich Smith, a trained firearm and toolmark specialist who works in the FBI's forensic laboratory, conducted a physical and microscopic examination of the insulated wires recovered from Laurel Street and the pair of wire cutters recovered from the Norfolk Street apartment. Smith will testify that the marks left by the wire cutter seized at Norfolk Street were found on the insulated wires seized at the Laurel Street that were part of the toggle-switch triggering assembly of the pressure cooker IED that exploded in Watertown. The basis for Smith's opinion is that the wires and wire cutter shared class characteristics (e.g., type of cutting action and size and orientation of gripping or cutting surfaces), and a microscopic comparison of the wires and wire cutter revealed matching individual characteristics (e.g., the style, intensity, direction, and pressure of the toolmark). Smith also used exemplars of the same make and model of the wire cutter found at Norfolk Street to determine if another cutter could have made the marks on the wires found at Laurel Street, and concluded that they could not. Therefore, this evidence links the assembly of at least one of the bombs in this case to a tool found in the Tsarnaev family's residence.

In addition to the above information, which is contained in the September 2, 2014 expert disclosure letter, the government has produced to the defense the *curriculum vitae* for Lieutenant Cahill and Smith; the final reports detailing the experts' methodology, findings, and conclusions; and the bench notes, photographs, and lab reports prepared contemporaneously with their

forensic analysis. See Bates Nos. DT-0036985 – DT-0036986, DT-0066490-DT0066549, DT-0073388-0073472 (attached hereto as Exhibits A-D).

ARGUMENT

Tsarnaev's sole argument is that the proffered expert opinion testimony of Lieutenant Cahill and Smith must be excluded because "toolmark evidence is so subjective as to make it inherently unreliable." [Deft. Mot. at 8, 19-25.] (Tsarnaev does not argue that either Lieutenant Cahill or Smith lacks the requisite specialized knowledge, training, and experience to be qualified as an expert under Rule 702; nor does he argue that they failed to apply the principles and methods of firearm and toolmark identification to the facts of this case, as required by Rule 702(3).) That argument is bootless. Courts have uniformly rejected such categorical challenges to the admissibility of toolmark identification evidence and, as Tsarnaev concedes, no court has completely excluded toolmark identification evidence from trial. Id. at 17. Consistent with established precedent, the Court should find the proffered toolmark identification evidence reliable and admissible and deny Tsarnaev's motion without a hearing.

Numerous federal courts have considered and rejected the same reliability challenges Tsarnaev advances in his motion, and all have concluded that firearm and toolmark identification passes the threshold reliability test. See, e.g., *United States v. Williams*, 506 F.3d 151, 161 (2nd Cir. 2007); *United States v. Hicks*, 389 F.3d 514 (5th Cir. 2004); *United States v. Casey*, 928 F. Supp. 2d 397 (D.P.R. 2013); *United States v. Monteiro*, 407 F. Supp. 2d 351, 356 (D. Mass. 2006); *United States v. Green*, 405 F. Supp. 2d 104 (D. Mass. 2005); United States v. Wrensford, 2014 WL 3715036, at *5-6 (D.V.I. July 28, 2014); *United States v. Sebbern*, 2012 WL 5989813 (E.D.N.Y. Nov. 30, 2012); United States v. Otero, 849 F. Supp. 2d 425, 431 (D.N.J. 2012); *United States v. Cerna*, 2010 WL 3448528 (N.D. Cal. Sept. 1, 2010); United States v. Willock,

696 F. Supp. 2d 536 (D. Md. 2010); United States v. Taylor, 663 F. Supp. 2d 1170 (D.N.M. 2009); United States v. Glynn, 578 F. Supp. 2d 567 (S.D.N.Y. 2008); United States v. Diaz, 2007 WL 485967 (N.D. Cal. Feb. 12, 2007); United States v. Natson, 569 F. Supp. 2d 1253 (M.D. Ga. 2007). Tsarnaev offers no compelling reason for this Court to depart from established precedent, and his reliability challenge, like all others before it, should be rejected.

As an initial matter, Tsarnaev's attempt to discredit the discipline of firearm and toolmark identification as lacking scientific rigor due to inadequate empirical foundation and inherent subjectivity is misplaced. The Supreme Court stressed in Kumho Tire that the reliability of expert testimony does not turn on the grounding of the expert's opinion in scientific principles; rather, the Supreme Court made clear that expert testimony on matters of a technical nature or related to specialized knowledge, albeit not scientific, may be admissible under Rule 702 provided the testimony satisfies the requisite standards for reliability and relevance. 526 U.S. at 149. See also Cerna 2010 WL 3448528, at *5 (stating that toolmark identification theory "need not be perfect science to satisfy Daubert so long as it is sufficiently reliable"); Otero, 849 F. Supp. 2d at 431 ("This Court expresses no opinion on whether the practice of firearms and toolmark identification constitutes a 'scientific' discipline because that is not the question before the Court. Rather, the Court must consider whether the Government's proffered expert opinion is reliable according to the principles of Kumho Tire [and] the applicable Daubert factors."). For the reasons set forth below, the technical and specialized discipline of firearm and toolmark identification satisfies all of the applicable Daubert factors and is therefore sufficiently reliable to be the basis for expert opinion under Rule 702.

First, the methodology behind firearm and toolmark identification can be and has been tested. See Daubert, 509 U.S. at 593 ("[A] key question to be answered in determining whether

a theory or technique is scientific [or specialized] knowledge that will assist the trier of fact [is] whether it can be (and has been) tested."). Tsarnaev does not challenge, and indeed, "[t]here has been no credible challenge to the underlying physical theory of how marks are transferred from the firearm to the cartridge case," or, for that matter, from a tool to another object. Monteiro, 407 F. Supp. 2d at 366. However, Tsarnaev argues that toolmark identification—the process of identifying class, subclass, and individual characteristics and comparing marks on different objects to determine if they were made by the same tool or firearm—cannot produce empirically testable results because it depends entirely on the subjective evaluation of the examiner. [Deft. Mot. at 15]. That argument is unsound. "Firearms [and toolmark] examiners are required to document their results and have their work reviewed by another examiner. These requirements ensure the reproducibility of the examiner's results" and permit defense counsel to challenge the results through their own testing and cross-examination. Monteiro, 407 F. Supp. 2d at 368-69. Moreover, numerous studies have been conducted to test the validity and reproducibility of toolmark identification. See Otero, 849 F. Supp. 2d at 432 (citing studies and noting that "literature in the field of firearms and toolmark identification documents that the theory has been repeatedly tested"). Those studies demonstrate that one can individualize tools, even when comparing marks made by tools of the greatest possible similarity; and that unique, distinguishing toolmarks on firearms are reproducible, such that over time the marks continue to be individualized to a particular firearm. Id.; Diaz, 2007 WL 485967, at *6 ("It seems clear from the literature that spent cartridge cases can be identified by an experienced examiner as having come from a particular firearm regardless of how many times the firearm had been fired.").

Thus, although the methodology of comparison and the process of rendering an opinion using the firearm and toolmark identification technique is subjective and based on the examiner's

expertise, "the requirements of peer review and documentation ensure sufficient testablility and reproducibility to ensure that the results of the technique are reliable," Monteiro, 407 F. Supp. 2d at 369; and the existence of studies testing the validity of toolmark identification theory demonstrates that the theory "is testable and has been tested." Otero, 849 F. Supp. 2d at 433. See also Taylor, 663 F. Supp. 2d at 1176 (finding that verification studies, together with documentation and peer review, indicate a "significant level of testability and reproducibility"); Diaz, 2007 WL 485967, at *6 (holding that "the theory of firearms identification, though based on examiners' subjective assessment of individual characteristics, has been and can be tested. Importantly, the literature from the field demonstrates that the traditional pattern matching theory has been tested—and verified—for the decades that firearms examination has been in existence.").

Second, the theory of firearm and toolmark identification is subject to peer review and publication. See Daubert, 509 U.S. at 594 ("The fact of publication (or lack thereof) in a peer reviewed journal [is] a relevant, though not dispositive, consideration in assessing the validity of a particular technique or methodology on which an opinion is premised."). The AFTE publishes its own journal (the *AFTE Journal*), which has a formal process both for the submission of articles and for post-publication peer review. *See* www.afte.org; Otero, 849 F. Supp. 2d at 433; Monteiro, 407 F. Supp. 2d at 366; Taylor, 663 F. Supp. 2d at 1176. The Scientific Working Group for Firearms and Toolmarks ("SWGGUN") lists two additional peer-reviewed journals: the *Journal of Forensic Sciences* and the *Journal of Forensic Identification*. See www.swggun.org; *Wrensford*, 2014 WL 3715036, at *5. The peer-reviewed literature "demonstrate[s] the reliability of the [toolmark] theory and process used by examiners in the field," *Diaz*, 2007 WL 485967, at *6-8 (citing numerous peer-reviewed studies), and although

some "peer reviewed articles have not universally been laudatory of the current technique of identification," "consensus is not necessary." Monteiro, 407 F. Supp. 2d at 367. Accordingly, this factor "clearly weighs in favor of admissibility." Taylor, 663 F. Supp. 2d at 1176.

Third, the known or potential rate of error among trained firearm and toolmark examiners is quite low. See Daubert, 509 U.S. at 594 ("[I]n the case of a particular scientific technique, the court ordinarily should consider the known or potential rate of error."). Although it is not possible to calculate an absolute error rate for toolmark identification because the process relies on the subjective assessment of the individual examiner, proficiency testing of firearm and toolmark examiners and peer reviewed validation studies indicate a very low error rate. See Otero, 849 F. Supp. 2d at 434 (citing results of proficiency testing and validation studies suggesting error rates from zero to 2 percent and noting the lack of false positives); Monteiro, 407 F. Supp. 2d at 367 (similar); Diaz, 2007 WL 485967, at *8 (similar); Wrensford, 2014 WL 3715036, at *17 (similar). Accordingly, this factor also weighs in favor of admissibility. See Monteiro, 407 F. Supp. 2d at 367 (finding "known error rate is not unacceptably high"); Diaz, 2007 WL 485967, at *8 (concluding that "the error rate for firearms identification among trained examiners is not a bar to admitting the testimony under Daubert").

Fourth, adequate standards control the process of firearm and toolmark identification. See Daubert, 509 U.S. at 594 (directing courts to consider "the existence and maintenance of standards controlling the technique's operation"). The AFTE promulgates standards for firearm and toolmark identification that provide uniform procedures for preparing objects for testing; analyzing test objects using a comparison microscope; identifying class, subclass, and individual characteristics; and determining whether the marks indicate "sufficient agreement" to conclude there is a match or not between the tool and the object. See Otero, 849 F. Supp. 2d at 434;

Monteiro, 407 F. Supp. 2d at 369-71; *Diaz*, 2007 WL 485967, at *9-11. Although Tsarnaev decries the lack of objectivity in the "sufficient agreement" standard, particularly as it relates to the identification of class, subclass, and individual characteristics, courts have found the standard sufficient to control the analyses of firearm and toolmark examiners. See Monteiro, 407 F. Supp. 2d at 371 (concluding that, despite the lack of a "generally accepted standard," "the trained eye will be able to distinguish among the class, subclass, and individual characteristics produced by the firearms"); Diaz, 2007 WL 485967, at *9-11 (finding that competent examiners understand, through their study of peer reviewed literature, training, and experience, the standards and procedures of firearm and toolmark identification; and are able to distinguish class, subclass, and individual characteristics based on their training and experience). Accordingly, although the firearm and toolmark identification theory lacks an objective standard, "competent firearms examiners operate under the standards controlling their profession. The practiced eye of a firearms examiner can render reliable opinions based on an evaluation of the evidence. Moreover, the requirements of documentation and peer review ensure that the standards are reliably applied." Diaz, 2007 WL 485967, at *11; Monteiro, 407 F. Supp. 2d at 371 (finding that "the maintenance of standards with respect to documentation and peer review weigh in favor of admissibility," and the "lack of a universal standard for declaring a match is troubling but not fatal under Daubert/Kumho because a court may admit well-founded testimony based on specialized training and experience"); Willock, 696 S. Supp. 2d at 571-72 (finding that, despite the lack of universal agreement as to what is required to declare a match, the relevant industry training courses and proficiency testing "demonstrate the existence of standards governing the methodology of firearms-related toolmark examination to enable a properly trained examiner to provide in-court technical testimony that will be sufficiently reliable[.]").

Fifth, the "pattern matching" method of firearm and toolmark identification is widely accepted in the relevant community. See Daubert, 509 U.S. at 594 ("Widespread acceptance can be an important factor in ruling particular evidence admissible[.]"). "It is clear that the community of firearm and toolmark examiners accepts the current identification methodology as reliable," and although some have suggested possible improvements, "the community of toolmark examiners seems virtually united in their acceptance of the current technique." Monteiro, 407 F. Supp. 2d at 372; Diaz, 2007 WL 485967, at *11 ("The ATFE theory of firearms identification based on traditional pattern matching appears to have broad acceptance in the forensic community. There has been no critique sufficient to undermine the traditional examination method as it is performed by competent, trained examiners."); Otero, 849 F. Supp. 2d at 435 (finding "general acceptance of the AFTE theory among professional examiners as a reliable method of firearms and toolmark identification"); Taylor, 663 F. Supp. 2d at 1178 ("[I]t does appear that the use of 'pattern matching' to determine whether or not there is a match . . . is generally accepted among firearms examiners in the field.").

In sum, analysis of the applicable Daubert factors establishes that firearm and toolmark identification is sufficiently reliable to be the basis for expert opinion testimony at trial. See Daubert, 509 U.S. at 595 (stating that the "overarching subject" of Rule 702 is "the evidentiary relevance and reliability" of "the principles that underlie the evidentiary submission" and emphasizing that the court's focus "must be solely on the principles and methodology, not on the conclusions they generate"). Contrary to Tsarnaev's claim, the lack of an empirical scientific basis for and the subjectivity inherent in the pattern matching method does not render firearm and toolmark identification evidence inadmissible; rather, these alleged "infirmities" and other criticisms advanced by Tsarnaev in his motion go the weight, not the admissibility, of the

evidence. See Daubert, 509 U.S. at 596 ("Vigorous cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence."); Ruiz-Troche v. Pepsi-Cola, 161 F.3d 77, 85 ("As long as an expert's scientific testimony rests upon good grounds, based on what is known, it should be tested by the adversary process—competing expert testimony and active cross-examination—rather than excluded from the jurors' scrutiny for fear that they will not grasp its complexities or satisfactorily weigh its inadequacies."). Because the proffered expert testimony of Lieutenant Cahill and Smith is based on a reliable methodology—firearm and toolmark identification—and is relevant to the task at hand—linking him to evidence connected to the charges in the indictment, it satisfies the requirements of Daubert and Rule 702 and must be admitted at trial.

Because courts have uniformly concluded that firearm and toolmark identification is a reliable basis for expert opinion testimony at trial, Tsarnaev has provided no compelling reason to deviate from established precedent, and the extant record in this case provides the Court with a sufficient foundation to rule that the government's proffered expert firearm and toolmark identification testimony is admissible, there is no need for a Daubert hearing in this case. Both Lieutenant Cahill and Smith are trained firearm and toolmark examiners with decades of experience in their respective fields; their testing reports and bench notes describe their application of accepted firearm and toolmark identification methods to the evidence in this case and contain the requisite documentation of their analysis; and their final reports represent their well-founded conclusions, based on their training and experience, that the Ruger fired certain cartridges and projectiles recovered from the Laurel Street location and that the wire cutter

recovered from the Norfolk Street apartment was used to cut wires that were part of the IED that exploded in Watertown.

Based on established precedent and the well-developed record, the Court can and should execute its Rule 702 gatekeeping function without resort to a pretrial Daubert hearing. See Williams, 506 F. 3d at 161 ("While the gatekeeping function requires the district court to ascertain the reliability of [the expert's] methodology, it does not necessarily require that a separate hearing be held in order to do so."). At trial, the government will, of course, lay an adequate foundation for the admission of its proffered expert testimony under Rule 702, including presenting evidence to the jury, consistent with that contained in the attached exhibits and disclosed to the defense, of each expert's qualifications, the reliability of the methods used, the facts and data relied upon, and the expert's application of the methods to the facts of the case. See Cerna, 2010 WL 3448528, at *6 (denying defendant's motion to exclude expert firearm and toolmark identification evidence and finding the expert testimony admissible without a *Daubert* hearing, but requiring government to present foundational evidence at trial sufficient to satisfy Rule 702).

CONCLUSION

For the foregoing reasons, the government respectfully requests that the Court deny Tsarnaev's motion to exclude toolmark identification evidence and request for a Daubert hearing.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that this document was sent to Dzhokhar Tsarnaev's attorney, Judy Clarke, Esq., on December 19, 2014.

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